UNITED STATES
DEPARTMENT OF THE INTERIOR

DI-6

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CONTENTS

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Scaphite collections - Nat. Mus. Czuzda, J.A. Jelitzky.

D. nicolletii complex

1. Casts from Cobban collection - variant with ventro-lateral nodes on early whorl. - it also has tendency toward elongate radiating umbilical nodes in end near body chamber. The ventro-lateral nodes extend to end of the body chamber.
   Mobridge mcmb (Roadside 2 mi S of US 14-16 in approx NE¼, sec. 13, T. 1N. R. 14 E., 3 miles E Westa. S.D.)
   Check these and other nicolletii-like forms from the Mobridge.

2. D. abyssinus Pl. XXXIX fig 3 of Elies., casts show nicolletii-like form, ventro-lateral nodes on septate part (J.A.J. says even to inner whorls. Slight radiating umbilical nodes on body chamber. (JAJ thinks possible forerunner of roznensis.

3. D. nicolletii - Cast of the type. - need to determine which variant this comes from. It has ventro-lateral nodes on septate part.

4. Scaphites nicolleti: Cast of the specimen found by J.A.J. in Maestrichtian of Hemmoor-Wurstade (Nordhannover) Germ. and mentioned by him in his note with Cobban & Reeside.

JAJ. points out that this specimen has the relatively large umbilicus, ventro-lateral nodes on septate portion and venter like typical nicolleti. Only specimen he knows from Europe that resembles D. nic as he conceives of the species.

Cast of crushed specimen, ribbing on septate part somewhat smeared but standard. Umbilicus broader than most nicolleti & whorl height does not expand as rapidly forward. Body chamber not preserved. Still D. nic is about all you could call it.

5. nicolleti vs constrictus

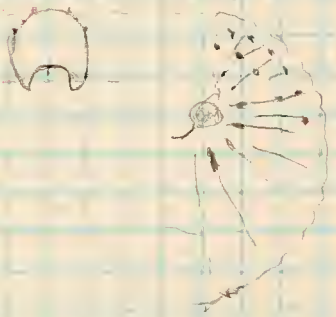
JAJ. holds 2nd specimens confirm that European constrictus characterized by small umbilicus, ventro-lateral nodes on body chamber only, relatively coarse ribbing except in v. tenuistriatus, and the flattened venter.

He believes that there is a

distinction between these two; points out Elias material and Mobridge forms, indicate distinct nicolleti types low in Pierre

Question is are there 2 distinct forms or do they merge. Necessitates study of D. nicolleti – thorough histort. and zoogeog. one.

6 D. roznensis: JAJ has one from Mobridge equivalent in Canada. This specimen a fragment of fairly stout though compressed form with coarse ribs. Numb. of spec. is (15)



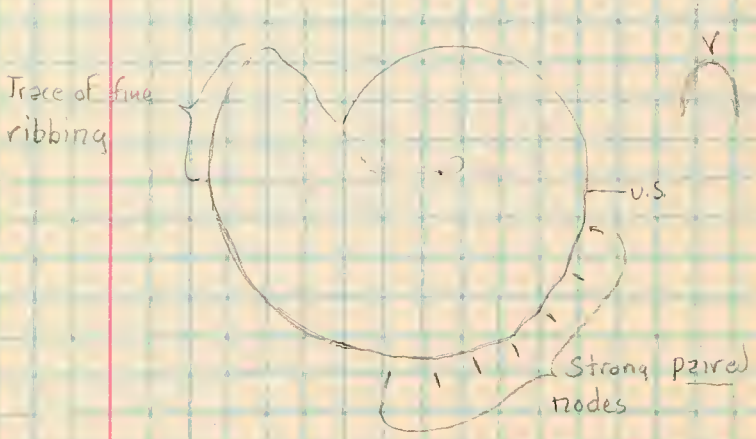
Nodes – ventro-lat. nodes on all but 3 reach ribs which are limited to v.l. periphery.

two lateral rows which die out forward and umbilical bullae which increase forward.

If this is roznensis, question of distribution in interior. Not reported (yet) from U.S. Mobridge. In Trail City it comes in at Limopsis zone. horizon. Several possibilities; either this not

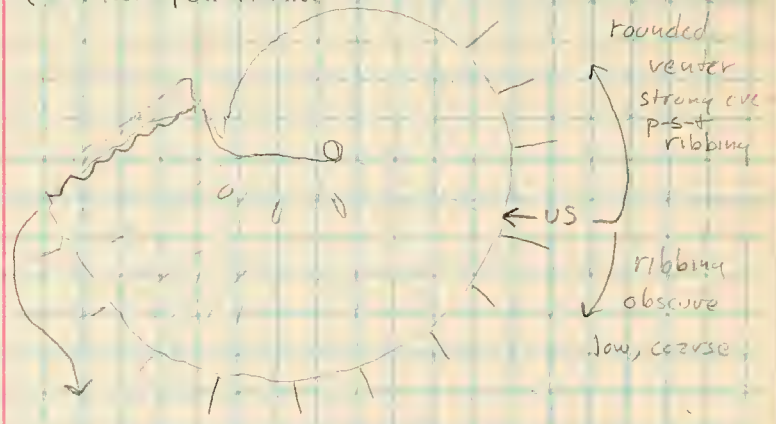
rozneusis or the Mobridge fauna could have been wiped out in U.S. interior and, after Elk Butte, interior repopulated. Much of this possibility hinges on whether Mobridge is the last fauna except for Mo. Valley area. Must take Canadian setup into consideration here.

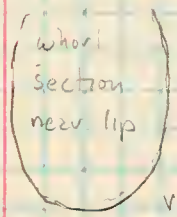
7. Scaphites constrictus Sow. Cast
Maestrichtian (Craie à Baculites)
St. Colombe (Meuche)
D'Orb. Coll. no. 7194
[Send to France for casts.]



Shoulders have been gouged flat in preparation, but umbilicus small.

8. Scaphites constrictus, from St Colomban. in CGS. No. 21122. limestone steinkern. (Identical spec. Plxxxi





septate whorls compressed but sl. wi., venter rounded; body chamber:- ored ½ quadrate after rapid expansion. Ribs on venter do not arch forward. as in American forms

9. D.(H.) nicolleti CGS 21816

Sheet prepared for this one.

10. Cast of "Scaphites nicolleti" fig'd by Meek in V. 9., pl. 34, fig. 2A. - from Cheyenne River near Black Hills. USNM 407.

This specimen has umbilical bulge and resemble Trail City forms except for

comparatively larger, flattened area and resultant confinement of the very fine ribs.

11. Problem of immature scaphites came up. JAJ is calling nodeless, small specimens, not uncoiled but with complete body chamber Ponteixites (Warren 1934, TRSC, 3rd ser., Sec. 4, Vol. 28, p. 81-99, pls.) These he has in "upper Bearpaw", or what we assume is high Mobridge. To me they look like immature scaphites but George says no - inner whorls of scaphites at this horizon have obvious nodes - moreover most of the Ponteixites (but not all) occur with large Rhaeboceras.

Obviously it is going to be necessary to firmly establish that small Fox Hills ammonites which don't uncoil as identical to inner whorls of undoubted scaphites before they can legitimately be called "immature scaphites". Might do well to try same for Mobridge.

JAJ has one specimen from lower in Bearpaw which is unlike any scaphite interior, and unlike the inner whorls of any Rhaeboceras which JAJ has in his collections

This specimen — C.G.S. 16332, may indeed be a Ponteixites. But obviously, if there are such things as immature scaphites, they would easily fit in loose definition of this genus.

12. Some European references of note.

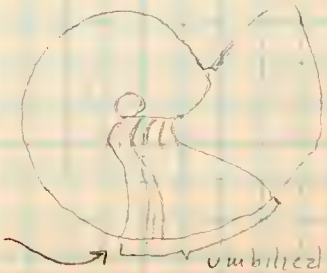
Lopuski, C. 1911 (JAV says this is rich evolute)
Contributions à letude de la faune cretacée du plateau de Lublini
Compte Rendue des seances de la Soc. Scientifique de Varsovie, (Warsaw)
IV (has scaphites) p. 104-140
and. V (no scaphs this part) p. 182 etc.

Mikhailov, N.P. 1951; Upper Cret. ammonites of Europ. pt. USSR and their significance for the zonal stratig.
No. 129, Geol. Ser. No. 50, 1951
Trans. Inst. Geol. Sci, Acad. Sci. USSR
(JAV. says this best and newest

13. S. constrictus -var tenuistriatus -
GSC 5342
S. Sask. Riv. opp. mouth Swift-Current
Riv. Sask. - Pierre-Fox Hills
Coll. T.C. Weston 1889.

Originally labeled D. nicolleti, these are smaller forms with not as high a body chamber, some differences in ribbing, which is generally fine, becoming finer on outer end body chamber. Has coarse or bundled ribbing on straight umbilical shoulder which may form bullae, 5-7 pairs strong ventro-lateral nodes on body chamber.

This is undoubtedly like nicolleti but marked different in detail. As JAJ point's out it resembles Nowaks. Illustrations of tenuistriatus, but the max. height of whorl on B.C. is not as great as in Nowaks spec. Ribs cross venter without forward bend. Apt. lack "beak".



14 Two specimens of nodose, constrictus-like species with distinctive form and ribbing. Compare var comprimus.

(a) Cast of AMNH. Cat. 24236, Cedar Cr. anticline, NW end, Geo. L. Dome sec, S. of Glendive, a little W of center of TWSP 14 N, R55E. Dawson Co. About 1000 ft below top of Pierre.
Strong widely spaced ventro-lat nodes running on to septate whorls. Little vertical expansion and gradual lat. expansion on body chamber. Umbilical bullae + ribbing finer on ant ½ BC but not as fine as D. nic.

(b) Spec. unknown loc. in CGS coll. - Bearpaw, Alta. Acute comprimus-like form, most BC missing. Broader umbilicus; from edge shoulder U.S. lies at about 2:30 instead of 3 to 3:30. No forward arch of ribs venter.

See also Meek V.9. pl. 25, fig 2 for similar, stouter, form.

15. S. pungens Binkh. 1861
Spec. — Cobban Coll. upper Bearpaw, Wolf Point Montana.

CGS. 10375. — Bearpaw fm., Belenger memb. ¼ mile N. of confluence Davis Co. & Frenchman River.

Two specimens are similar in form

except that Cobbeus is slightly stouter and has fewer and coarser ribs on septate portion.

CGS 10375

Paired heavy ribs of bullae but all ribs weak on nodose part BC. Ventro-lateral nodes strong on BC, die out on exposed part septate whorls

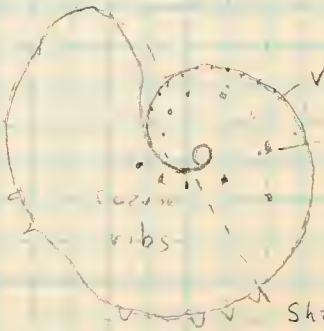
These "Mobridge" forms differ from S. nodosus var. quadrangularis but little in form, though are more compressed laterally than Meeks similar quadrangularis (IX, pl. 25, fig 4). From this same specimen they

Is differentiation of ribbing characteristic of all the late interior scaphite stocks? Investigate.

differ in the differentiation of the ribbing. Otherwise similar in coarse ornamentation

Although intermediate steps are lacking (so far), this form resembles some of late Trail-City, strongly hooked, quadrate-sectioned, multinodose types.

16. Cast labeled loc. 21584 (USGS)
Sage Creek road 1.1 miles south of turnoff from US Hwy 16, 5 miles SE Westa, in SW¼ SW¼ sec. 18, T. 1 N., R. 15 E., Pennington Co., S.D. – Note on label "specimen thought to resemble that of Meek, v. 9, pl. 35, fig 4.) called in text S. abyssinus. – this is Cobban's idea, George disagrees. So do I.



Ornament like puncens except for lateral row. and finer ribs on septate part.

Looks as if it skipped some growth

Sharp change in ornament with off-set of lines ventrolateral nodes

11

17, Cast of Scaphites pungens Binckh. fig'd by Grossouvre 1908, p. 37, pl. XI, fig. 12, b, c - Lower Maestrichtien, Kemmerer.

This specimen has less recurved hook + more open umbilicus than JAI's CGS 10375 and is larger, ^ Septate whorls poorly preserved but show a subsidiary row of nodes on flank near the ventro-lateral row. Prominent umbilical bullae. BC ribbing like that on two spec. noted under 15.

This seems a clear cut form. Look up original description.

18. Other Grossouvre fig'd spec., in texts poorly preserved and text figures are more helpful. G. includes a great variety within constrictus. None very close to type

Pl. XI.

fig 3. A fat form, small umbilicus large umb. swelling with one big node. Other characters vague

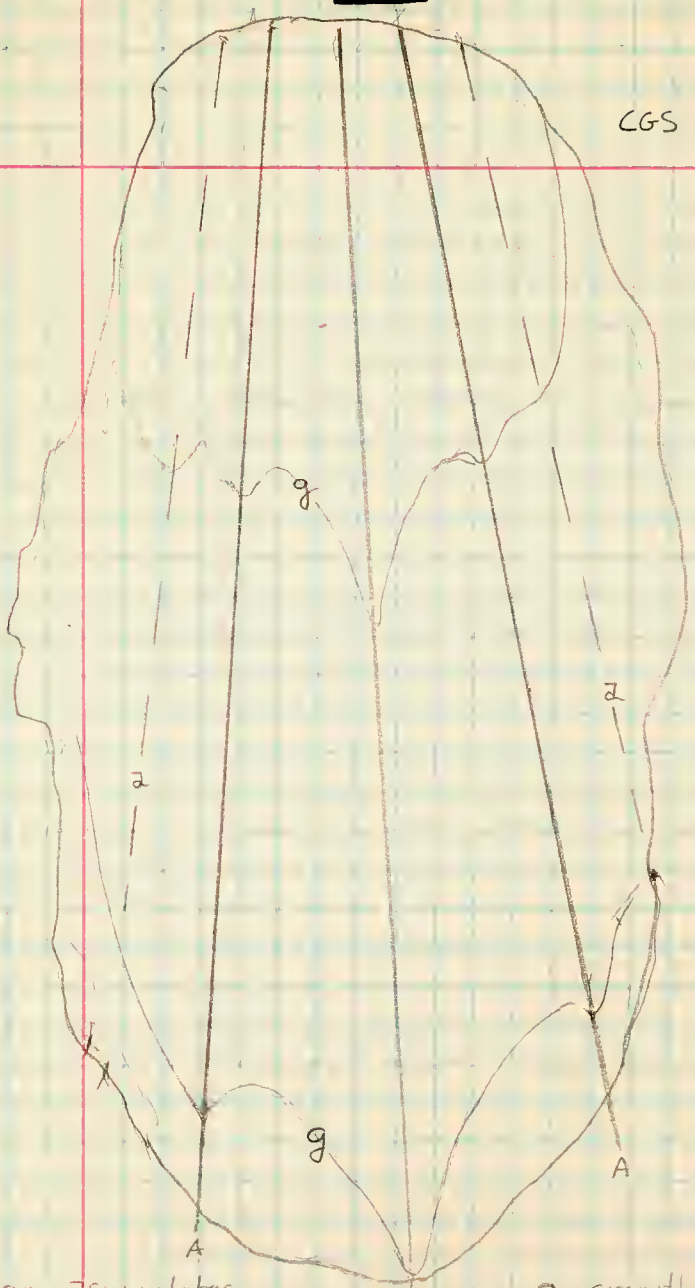
fig 4a, 4b & 4C - more like a small pungens but with smaller umbilicus, no nodes on septate part. It seems

to have the prongers rib characters on the BC., though in septate part they are finer + more numerous than in the 2 spec. noted in 15.

Figs 5+6. Poorly preserved, much compressed forms lacking the expanded (vertically) BC which seems typical of S. constrictus. These are more like abyssinus in form, though no nodes indicated on venter — as far as can be seen — is not flattened.

19. Actinosepia canadensis, Whiteaves.
CGS 5379
Pierre-Tex Hills, S. Sask. opposite mouth of Swift-current Creek.
[JA] note could be synonymous with Belotenthis on generic level, cf Belotenthis subcostata, d'Orb. 1845-46" Dates!? "Mesoteuthoidea Naef 1921. Belotenthidae Naef 1921.]
JAN. says no interlaminated calc. layers therefore must be a teuthoid.
CGS 5379 is fairly thick layered dk brn to brnish black. Although sharply raised asymptotic ridges are worn here and there to produce unevenness, there are no

CGS 5379



A. Strong asymptotes
z. Weak asymptotes

g - growth lines

tubercles on the specimen. Apparently the name Actinosepia refers to the sharp, spine-like protrusions forward of shell at asymptotes.

CGS 16395 – another from 300 ft above base of the Bearpaw. No reason not to call it same thing. Alike in composition. Both rather flat with 3 raised asymptotic ridges – these do not so much mark appreciable change in plane of shell as broad (broad, sharp) ridges on rather even low arch. Weak lateral asymptotes present on both.

CGS 16395 shows no tubercles whatsoever; growth lines obscure but seem to project forward, at least along central asymptote, as in 5379.

Definitely not the same as the Trail City specimen, leaving possibility that 2 spec. above represent only the inner layer of the shell. Check this.

Field-1959

Verdigre localities

A- Shale cuts east and west of road. Fossils (ammonoids) in shale upper part cuts. Brownish gray shale with Fe-stained small concs - mostly barren. Base of cut with bluish-gray weathering shale containing horizontal U-shaped worm tubes. Cut is about ½ mile south of RR crossing on Rt 14

B. Road going east from US 14 at Verdigre cut-off. Several good cuts. Rough succession follows - descending.

1. Gray shale with semi-indurated gray shaly silt layers, scattered red brn. weath. Fe stone conc layers and a few white punky concs. which look calcareous - some small, holey.

Zone of gray shale with cone-in-cone concretions.

Brownish shale (on weathering) with small Fe-stone concs & scattered ammonites - baculites in float and scaphite fragments.

Dark gray shale, more sticky & blocky bluish cast, sharp color distinction. U-shaped horizontal worm tubes in this zone.

A considerable (covered) interval below bed above comes the light-colored, chiefly light gray to yellow gray silty beds that crop out around intersection of Rt. 14 and road to Verdigre.

Stevensons comments on the Elk Butte member in the Gregory Quadrangle (see the map) suggest that the Verdigre section is Elk Butte. Ask him if his reference to Discoscaphites in the Elk Butte is from the Verdigre occurrence.

June 18'14

Loc. 45. New railroad cut in NW¼, sec. 15, T. 19 N., R. 29 E., Wakpala SE Quad, just east of the RR bridge and causeway across the Grand River. Mobridge member — no section measured — beds dip E about 3° thru western ⅔ of cut, east third has gentle W dip. Lower part of dark gray, slightly calc. sh. with red-brown weathering concs. — scattered or in zones. Upper part consists of similar shale with layers light gray conc. limestone which forms small ledges less than one foot thick, and scattered cream to buff colored small calc. concs. — and a few thin beds of greenish bentonite. Above this part lighter gray shale with gray ls concs — light rinds.

Spot samples for forams from beds below shale with ls layers

S-1	1 W — from about 5' above grade	60 yds E. of W end cut
S-2	½ W above S-1	
S-3	½ W above S 2	
S-4	½ W above S 3	
S-5	½ W above S 4	

In S-1 interval — S. nodosus fatuzr with aperturel nodes.

Fossils:— Baculites scattered in shale throughout beds in cut — most abundant fossil. A few scaphits — also scattered. Note large nodosus-type

well down in section - seems very close to similar one in the Trail City member. Large fossils other than heteromorphs are rare, but numerous small clams & snails in shale.

Fossils bear little or no relation to concretions - more in shale than in concretions - though the living chambers of baculites and scaphites are almost consistently filled with concretionary ls. A sparse but distinctive fauna in shale - including small pecten(?) unusual scabbard-shaped tube, like a large, elongate hemulid. worm. Shale shows "Yuccoid"-like markings commonly.

Attitude on limestone layers in cut. N. 46° W, 3° NE.

Gravel pit A, is borrow pit N. of Corps of Engineers Rd running to new RR bridge over Mo. River from the Wakpala Rd in NE 1/4 sec. T 19 N, R. 29 E (Wakpala SE Quad.). Pit is in sec 13 just beyond E. limit of the quad sheet. McBridge member cut into at base of pit. Few fossils.

Loc. 46 Crawford Ranch: Spur just east of road to Little Eagle just W of center, sec. 13, T 19 N, R. 26 E. Lower Trail City with D. nicolleti concretion layer in place in exposure on west side toe of spur and PB-Gervillia concs in turf on toe and in float.

Section at exposure:-(ascending)

(1) 6.0 Slope wash below nicolleti conc. about 3' bedrock of dk. gray silty clay and with O-stained silt. Nicolleti concretion in upper 1.5 another at same level, laterally Large Gervillia concs and small grey-weath. barren concs below D. nic

(2) 10.0 As above, without obvious concretions, some sloughing from edge of bank above

(3) 1.2 Grass roots zone with various concs. probably near PB zone

(4) 5.6± Grassy slope with Gervillia and PB concs in turf. No discernible order - both found at top of interval but suspect settling and slope wash. Probably ~ 16 to 18' above the D. nic concs.

Loc. 47

Crowfoot Ranch: Toe of spur just east of Little Eagle road in center E½ E½ NW¼ sec. 13, T. 19 N., R. 26 E., the next spur N along road from Loc. 46.

No good exposures here but an abundance of fossiliferous concs. from lower Trail City are weathering out of lower part of spur. Various parts of spur do not hang together stratigraphically and are probably successive slumps.

Localities

46 and 47 appear to contain both individual PB and Gervillia concs and concs in which the two types of accumulation are joined in single large concs.

A very few concs with dominance of Pteria nebrascensis and Protocardia in float. The Timber Lake beds and concretions above the lower spurs appear unfossiliferous here - similar to section at Bullhead. What governs distribution of the Timber Lake marine fauna?

Loc. 25 Bullhead.

Section 1. Main bluff (westernmost) - N of River

Begins at "upper Is. conc. zone" and ascends.

① 15.3 (massive clayey silt + sand zone)

At base
Dark gray to brownish gray clayey silt, finely sandy. Has mottled Fe stain. Sandy patches + plant frags. scat. throut
Zone calc. gray to blue gray Is concs at base. which have light gray chalky to yellowish rind. + commonly Fe stain on outer surface. Some yellow sulphur mottling.
Becomes increasingly siltier and sandier upward. At top is a sandy gray silt; mottled with brngray shaly silt blebs.

118.0 { ② 38.5

Banded silty orn-gray shale with finely broken up plant frags, and laminae + thin beds of fine ss and sandy siltstone - light gray. Some orange brn Fe stain on sandy layers. Occasional lense of semi-indurated sandy silt, - platy friable, plant frags common, weather platy gray. Becoming sandier in upper 10'±

③ 16.5

As below but sand predominates, is a buff-weath sand here whereas

Section 1 - continued next page.

Fossils in section 1:- Chiefly in unit 5 - Teucrediz americana and associate fauna which includes:-

Ostrea

Lunatia ?

In section 2 note that the lowest fossils include Pteria linguiformis and Ostrea - and that Teucrediz fauna does not come in with these - but just above them

Note - so far no fossils in the banded beds below the Teucrediz sand.

Suspect banded beds a facies "shoreward" of P. linguiformis sands, but where does Teucrediz-Heterymenites fauna fit in environmental set-up? Where is rich marine fauna of type area (Lantry-Eagle Butte) sands in the Bullhead region? Does it come in to the east?

below it is grayish. Sand is a "subgraywacke", fine to very fine grained. Shale layers scattered, gray to dk gray, silty but plastic, carb. fragg.

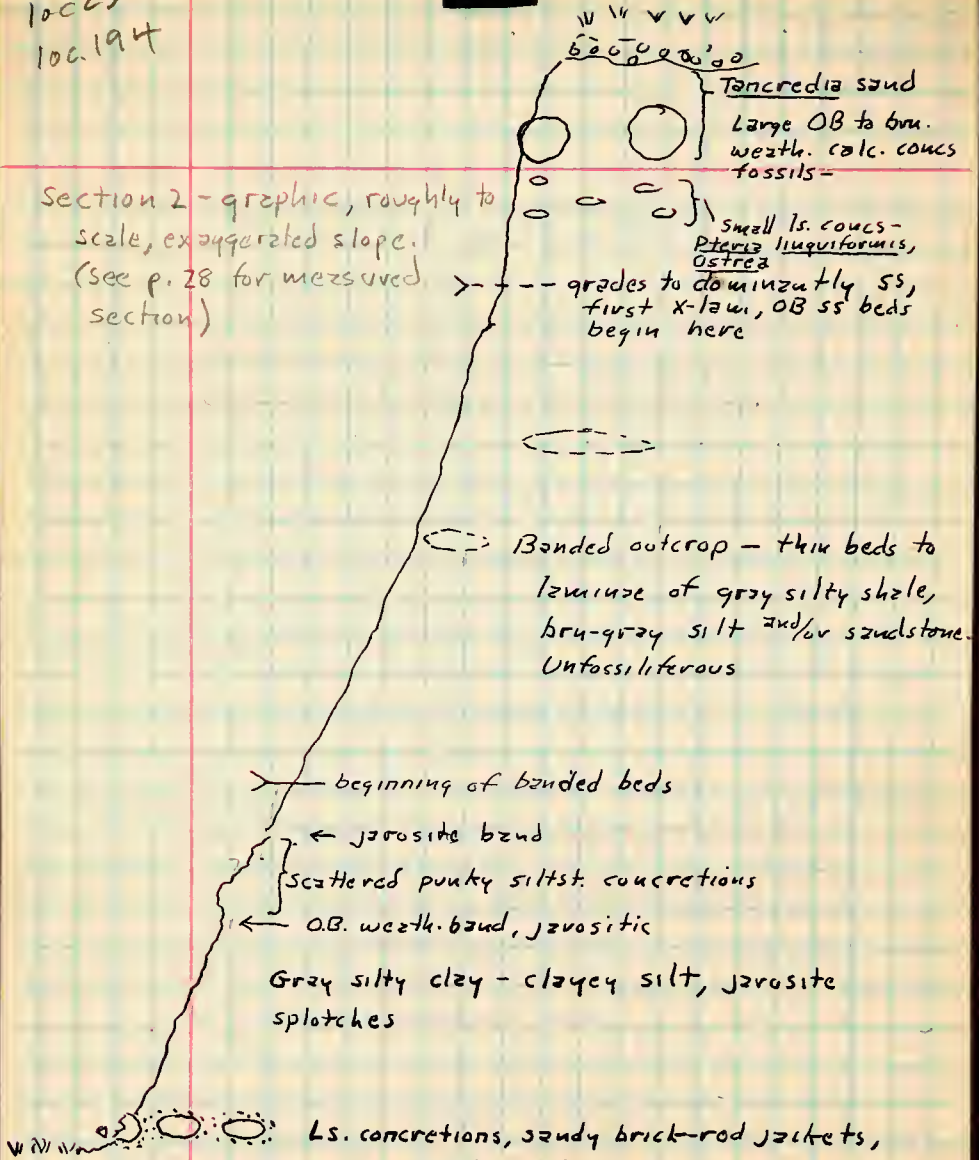
(4)
27.0 Above, a buff weath. obscurely thin bedded, massive weath. sd with dk shale partings. Big concretions begin at base of this interval. These are Fe stained, calcareous - cement sndy concs, some with limestone cores and some have scattered fossils. In this interval mostly platy, shelving concs

(5)
11.0 Little or no shale in this interval and abundant fossils in sand, also larger massive concs. up to 4 or 5 feet in diameter, with same fossils in sand

(6)
25.0 Sand as in (4) above, with scattered shale partings and platy calc. concs

Top of bluff.

loc 25 sec. 2 =
loc. 194



Section 2 - graphic, roughly to scale, exaggerated slope. (see p. 28 for measured section)

This is "upper limestone concretion zone" of sections 1 and "upper conc. layer" of section 4.

Section 3. Measuring up from Gerville concs at toe of spur.

Concretions - Gerville measc. in grass roots through about 2 ft (vertical). Measurement starts at top of highest.

① 16.5 Dark gray silty clay → clayey silt mottled with OB. Fe stain and yellowish gray. Sandy, no obvious divisions, more silty at top also sandy. No shaly structure just irreg. shaly & sandy partings here & there, lumpy break.

② 1.5 - 2.5 ft Zone limestone concs, dk gray interiors, Mn stain on cracks, very thin rind scaly brown. with gray-white patina beneath - or on weathered surface. Some yellow calcite in cracks.

In lower 5' scattered fossiliferous concretions - about this zone between 5' + 8' from base ± some barren concs. Order of concs not known

Section 4, Measuring up from brown conc zone unit ② of section 3

①	4.0	Dark grey lumpy silty clay + clayey silt, mottled with OB and yellow brown – as in unit 1 of section 3.
②	3.0	Shale, grey silty becoming silty + sandy at top and grading into unit 3.
③	7.0	Grey silty clay with pockets + blebs of silt and fine sand Blotches Fe OB and some yellow stain
④	0.5±	"Upper conc. layer." Maroon jackets, dense blue grey ls conc. with yellow calcite filling. Sparsely fossiliferous Nucula and Scion? commonest.

a.3
7.2
7.3

[25 sec? = loc 194] [sec 8-25] CM

Section 2 - detail

(1)		Upper concretion layer (maroon jacket - calc. yellow filling - muculiferus)
(2)	23.1	Silty clay grading upward to clayey silt, dk gray to gray, weathers to light gray. Upper 11' commonly puffs to crude popcorn, locally brown zone on slope about 2 below up top is local zone of pyrositic. Local punky silt concs. in upper 2'. Considerable OB + pyrosite stems scattered thruout unit.
(3)	3.0	Clayey silt as below
(4)	53.5	Thinly interbedded and interlaminated silty shale, siltstone and fine-grained sandstone, with SS & siltst. increasing upward. Local indurated ledges from 27' up. Gradual color change from gray to yellow gray. Local platy calc barren, flat concs 47.7. Some OB stain in upper
(5)	23.5	Chiefly sandstone, massive, x-lam but showing scattered banding — in lower part by shale ptngs, in

upper part, ss, concs + fossils. Gradational from unit below from which is is distinguished by first appearance of bed of x-lam, OB weathl ss.

Between 8.0-9.0 fucus base small calc. concs, some with fossils. 9.0 local large flat calc. concs. About 16.5 from base very large OB to red brown up to 4' diam, some with scalloped fossils

Gravel + silt cap.

fossils -

(1) Vola, long diam and sculpture fragment.

(5) Unit fossiliferous from 8' above base to top -

Cstrea

C0430 → Pteria linguiformis occur in lower part of fossiliferous zone.

Tancredia fauna - in and above the big concentrations

Loc. 48

Badlands in NW-facing bluffs south of Hump Creek in N½, NW¼, SE¼, sec. 31, T. 21 N., R. 23 E., Black Horse NE quad., Corson Co., S. D. One mile E of S.D. route 65

Excellent exposures of lower Hell Creek, part of upper Hell Creek and - in gullies at foot of bluff, contact with Fox Hills.

In mud butte in center NE¼ NW¼ SE¼ sec. 31, banded beds overlie massive buff-gray weathering, friable sandstone shot with Halymenites and containing the Zonerodia fauna. This sand is 10' or more thick with spectacular exposure of Halymenites. Contact with overlying banded beds marked by thin shaly limonitic concretionary material that is bright OB on outcrop.

Banded beds of sandy clays (? - not investigated) are overlain by massive sandy clays (?) weathering to fluted outcrop. Mn concretions, fossil wood and bone fragments litter banded slopes which weather to bad-land fluted topog. Not known from what part section fossils come.

Sharpest lithologic break at top of Halymenites sand. This is presumed to be contact

but — 1. No sign of lignite or lignitic shale the Denson + others report at contact in this area.

2. Is Halyniemites sand an unconsolidated phase of the Colgate?

Restudy this area. — possible composite for Hump Creek area.

Restudied. - Colgate is massive fluted sand

Loc. 49

Butte capped by silicified sandstone just south of road from S.D. 65 to Bullhead, just N of center N½, sec. 21, T21N, R23E, SDGS McIntosh Quad., Corson Co.; east bank White Shirt Cr.

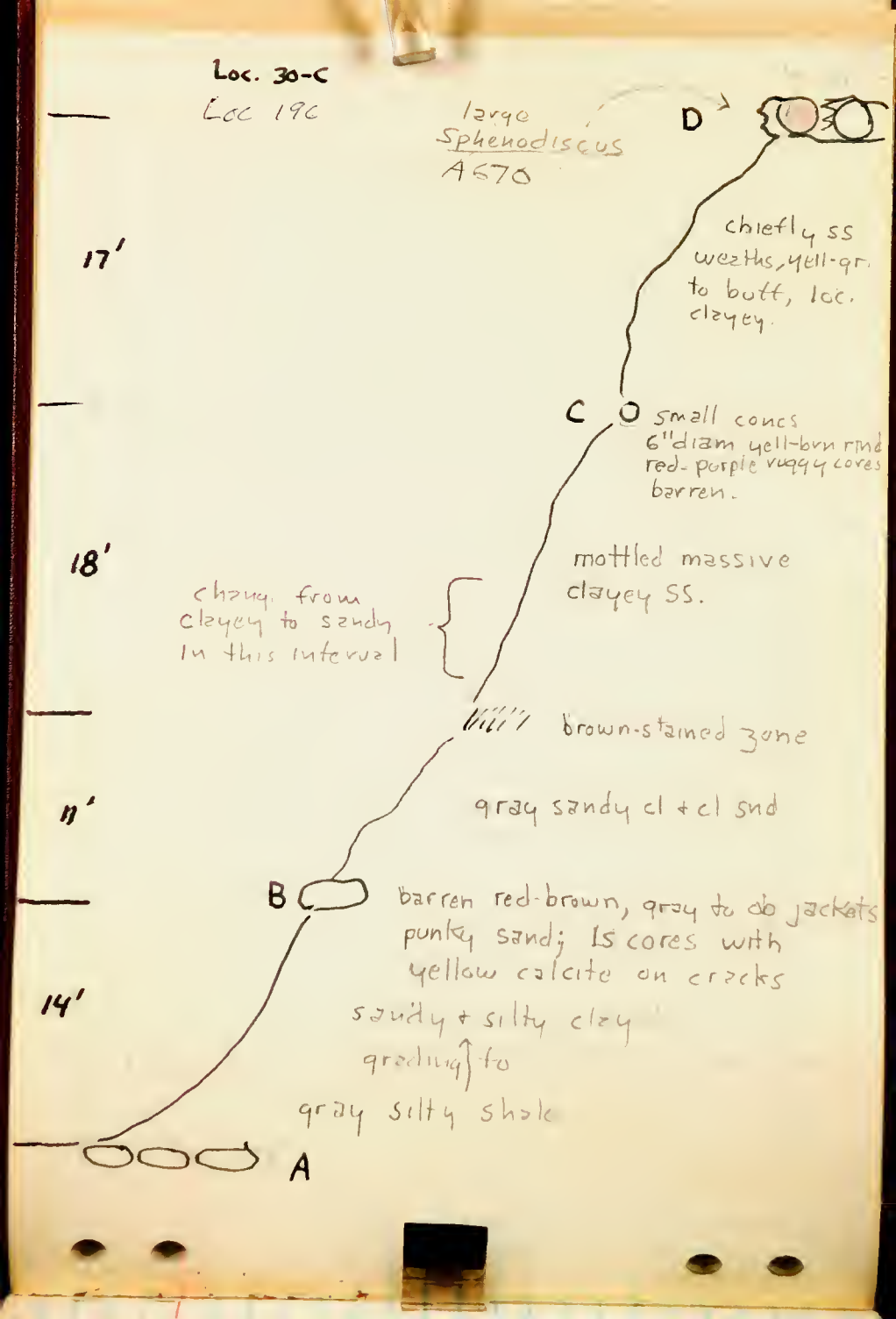
Up to 20'+ of indurated ss with few thin Halymenites tubes, finely broken plant frags. Also found tooth marine reptile? in place. Apparently overlies upper braided Fox Hills — Tenuredia fauna in sand on S.E. slope not more than 25 or 30 ft below the butte cap (this is a guesstimate).

loc 207

To west in road cut about ¼ mile west of White Shirt Cr., south side, is sandy lense in Fox Hills full of Tenuredia — collection marked Loc. 49 from this spot. A Colgate-like, unindurated, ss lense in top of cut.

A290

Slump + talus prevent section here


Loc. 30-C
Loc 19C
large Sphenodiscus A670
D
chiefly ss weaths, yell-gr. to buff, loc. clayey.
17'
C
small concs 6" diam yell-brn rnd red-purple vuggy cores barren.
18'
mottled massive clayey SS.
chang. from clayey to sandy in this interval
brown-stained zone
gray sandy cl + cl snd
11'
B
barren red-brown, gray to ob jackets punky sandy ls cores with yellow calcite on cracks
14'
sandy + silty clay grading to
gray silty shale
A

Loc. 196

Loc 30-C

Southwest face of Butte shows fair section upper two-thirds barren layers gray ls. concs. with some yellow-brn calcite intervals - weath. yellowish gray, gray, rare reddish brn = layer at sample 1 of 1957 section Loc. 30.

From this layer approx 32 [illegible] which is lig yellowish gray [illegible] gray brn.

11' to barren conc layer at slope shoulder [illegible] gray clay [illegible]

17' to red-brn weath. layer is concs with yellowish-gray weath pinkish gray [illegible]. Numerous [illegible] large [illegible]

See above for skeleton section

Loc. 30. From conc. A of above section down to big barren rb. concs of Loc 30 section (1957) - hand-levelled at 20.0±

This is wrong - see Ntbk 59-2, p. 12 and 13

On old section this is same as between barren concs at sample 5 and barren ones at sample 1. In this old section, the 41.5 feet between big red spheuodiscus-bearing concs at top (= conc. D) and the conc. layer (= A) at top of sampled section, includes slump which eliminates 18'± of section.

Loc-30-C - Could probably get a detailed section here with a little digging Sphenodiscus found in place in top concretion layer (D) which supports many spurs in this general area.

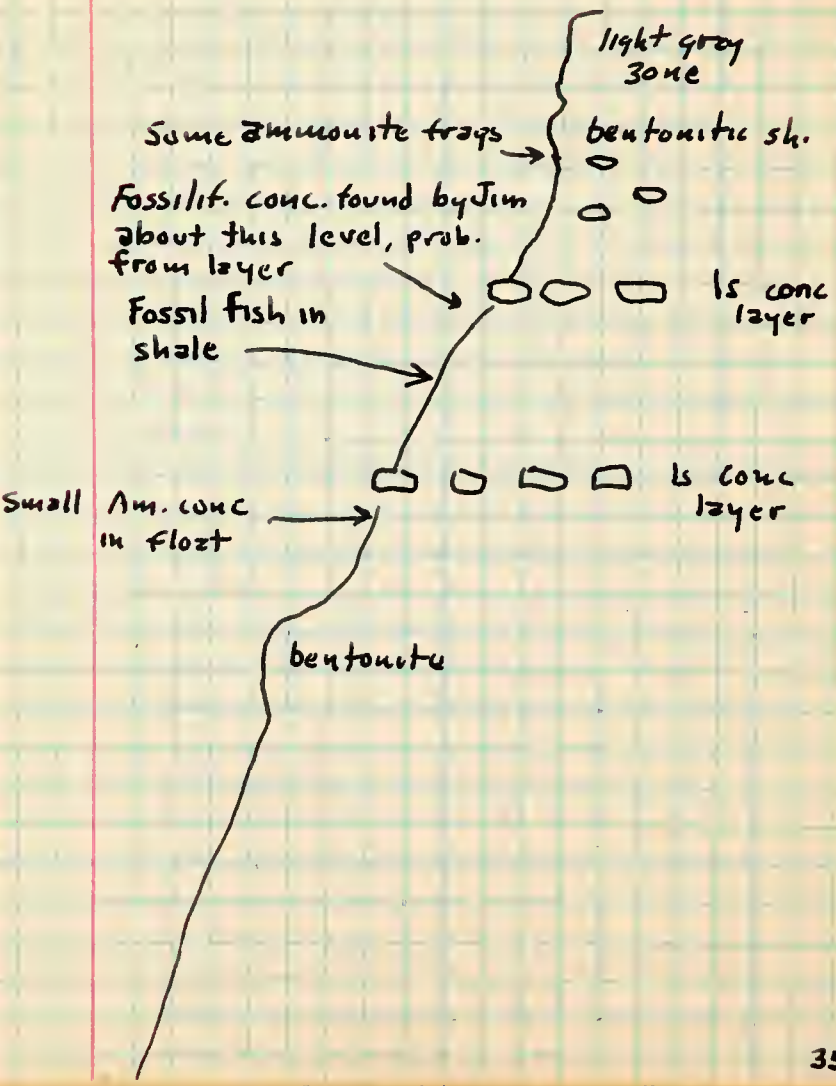
Use this section to correct the composite for locality 30.

Long spur E. of Localities 30, A, B, C. Road which takes off to SE from S.D. 63 just opposite gate to O'Leary ranch follows along this spur. Exposures are poor throughout; where much bedrock exposed it is full of slumps of all sizes. No chance for sections, though on one part it was possible to hand level interval betw. large Sphene & Cuc. concretions and the yellow-jacketed P. linguiformis ones above. It was 16'.

This interval included some of the very fossiliferous small grey cones but not precisely in place. Fossils on the entire spur are relatively poor picking.

Note: In Rt. 63-Moreau area beds from big Sphero conc's to yellow rind P. linguiformis carry most of marine fauna of Fox Hills.

Loc. 32 Search for additional material of node-less Nicolleti.



Loc. 50

Southwest-facing scarp of butte-like toe of SE-trending spur (BM Church) in center SW¼, sec. 26, T. 20 N., R. 26 E, Little Eagle NW Quad., Corson Co.

The locality includes adjoining outcrops and float areas on adjacent parts of spur. Exposures extend from well down in Elk Butte member through most of what is generally called Trail City. Latter excellently exposed, highly fossiliferous.

A small fault cuts off tip of spur toe from rest of spur; toe is up-thrown. Section 1. is of Fox Hills on bare SW facing scarp of toe. Note (1.) nearly cyclothemic occurrence of banded and massive rock; (2.) absence of a distinct peanut-brittle concretion zone. (3) presence of a fairly broad zone of Gervillia concs with lowest having abundant Limopsis. (4) presence of concs with large Gervillia just below regular G. conc. zone. (5) Large G locally in all conc layers, even Probeerdia. (6) Odd-ball "nicolleti" concs. found in float by Len. Have spinose forms which heretofore found only in PB. - may be upper nic. concs. — but none in place in this locality.

Locality 50 - Section 1, Southwest face at tip of butte, toe of spur.

Elk Butte (in part)
Base of slope

① 22.8 Shale, gray, silty, blocky fracture to platy, brown Fe stain on fracture surfaces. Weathers to tiny lite gray shale chips. Noncalcareous, gypsum Xls. Upper foot variable, mottled lighter and darker gray with few jarosite splotches. - gradation into interval above

Trail City

② 1.6 Shale, silty, mottled light and dark gray and jarositic yellow, with heaviest concentration of jarosite in upper half.

③ 2.0 Shale, as above in ②, scattered jarosite blotches and heavy concentration of jarosite in upper 0.5 ft. Upper half of interval contains scattered concretions - flattened ovoid up to 1' thick; silty, commonly punky gray limestone cores and thick light gray-weath. rinds which are highly silty and show lamination and cross-lamination. Cores weath. with light reddish stain; are barren in this locality.

④ 6.7 Clay, silty, gray, semiplastic with irregular laminae and pods of silt.

weathers lighter gray than underlying Elk Butte sh. Has no obvious planar structure. Brown stain on irreg. fract. surfaces and some jarosite blotches.

In upper 2.0± scattered ls. concs with thick calc. siltstone jackets which weather light gray and have thin gyp and black? rind. Some barren, some with D. nicolleti.

(Conc. A collected in place)

⑤ 16.0 Silt, clayey, weathers light yellowish gray; similar to unit ④ except for preponderance of silt mixed with lesser amts of very fine grained ss and dk gray silty clay. Base at 5" bed v.f.g. silty ss. Lacks jarosite blotches, some yellowish brown to O-B stain. Upper 5.0 becomes crudely banded. Top arbitrarily taken at base of thin layer (local) well-banded gray clay and buff v.f.g. sand.

7.0 from top a few scattered ls. concs with silty jackets containing large Gervillia and some Limopsis "peanut brittle" Layer of scattered Gervillia (small) concs begins 4.0 from top and extends into lower 2.0 of overlying unit ⑥.

⑥ 8.0 Clay, silty and sandy predominates in lower 4.5, with some jarosite blotching near top. Remainder of interval mixed fine-grained ss, silt and silty clay, the whole crudely banded. Gervillia concs

found up to 2.0 from base of this unit.

(7) 6.0 Sandstone, v.f.g. to f.g, clayey, silty, somewhat glauconitic, grey to greenish or yellowish grey in lower 4.0 which is mixed and mottled except for lower 0.6 ft. that is a laminated to x-lam. yellowish grey to greenish sand and silt.

Between 3.5 and 5.5 from base sand becomes an OB to reddish semi-indurated crumbly ledge containing subspherical, ±1.0, to irreg. knobby limestone concs which weather red-brown and are fossiliferous - contain loc. a PB of *Protocardia* and/or masses *Pteria nebrascensis*. Crumbly ledge is silt-sand with $CaCO_3$ cement, its OB weathered color is in contrast to greyer surrounding beds.

(8) 3.9 Sandstone vfg, fg, clayey, irregular pods silty clay. Mixed and mottled in lower 2.2 but upper 1.7 is interbedded dk grey shale and Fe-stained f.g. ss that weathers to conspicuous rusty band on outcrop.

(9) 4.8 to ? Shale, silty, light grey, purplish plant fragments. weathers to light grey slope

Grass roots at top of bluff.

Loc. 50 - Section 2. SW facing scarp about west of section 1 and about 100' west of fault. Beginning at top of silty-sand ledge made by jackets of *Protocerella* cones. (i.e. - top unit (1) of section 1)

(1) 4.0 Sand, vfq-fq, silty + clayey, massive, rough irreg. mixed, subgraywacke with glauconite. Mottled gray, lite green-greenish gray with orange to maroon stain on fresh surfaces. Wths yellowish gray, higher Fe concent. in lower 1.5. Inch + Fe brown impreg. sand 1.5.

(2) 3.2 Shale, dark gray silty to finely sandy with irreg. blebs + laminae of silt, weaths gray. Lower 0.8 to 1.0± is Fe impreg. interlam. silt-sand layers & sh. ptngs. weaths red to OB + loc. forms crumbly Fe-stained ledge. Shale in interval has carb. plant frags weath purple.

(3) 5.0 Shale, silty & sandy grading within 2 foot or two to more massive sandy silty ~~clay sand~~ with pods of clay sand & silt mixed. Considerable shale - really a massive mixture sand, clay, & clayey sand. Yellowish gray, plant frags
At top zone small dk blue gray lt. cores lite gr to gr-white patina, thin silty rinds No fossils seen flattened ovoid up to 1.2± l.d.

(4) 9.5

Clay, locally shale as below, mottled - mixed dk blue gray silty clay, and gray, yellow to O weath, vfq + fq subgraywacke sandy and silty. Grades to units above and below.

In upper 2.0 scattered large, up to 3.5 l.d. Ovoid ls concs. Weath yellowish gray to brn, with cracks filled with yellow calcite, some plant frags in them. Thin whitish-yellowish gray rinds.

Break at top this interval taken at color change from dem. gray to dem yell. gray + buff.

(5) 9.8

Clayey sandy silty very little carbon in shale in irreg lenses + blebs, yellow gray on fresh fract cut, some O. blebs + layers.

In upper 1.5± small ls concs av. 0.5 l.d., round to ovoid hard dk blue-gray cores weather exfol. red-brown, fossils locally but very rare.

Top of hill.

O'leary

maps 300, 301
Central NE

Loc. 31 Unit 2, Section 2

Measuring up from about 1' above base of first river terrace level.

(1) 16.8 Shale, clay, finely silty, calc. grey. 0.2 bed semi-indurated calc. clay begins 1.5 from base above 5.5 becomes less clayey & calc., more fissle, weathers to light grey chips, has splay fract., loc. silt lenses, & gyp blebs 7.2 feet from base is thin (¼-½") bentonite. Inoceramus & fish scale in upper 2'. Many fossils visible in fissile stuff above base 5.5.

(2) 0.2 Waxy yellow green bentonite

Loc. 38 Bottle S. of O'Leary ranch. - Slump obscures all but upper 50'±. No tie in possible now - see old section. From crumbly OB conc. layer beneath dark grey glauconitic sandy clay is 31.5± ft to base indurated cgrock 24 ft of which present here. Only about upper 20' silic. grey "Colgate" with small Hely and clay-pellets. Lower 4' much clay-pellet, Hely's and impression of ammonite. Top big redbrn conc layer to glauconite bed is 26' - but slump may intervene.

Loc. 51 – See Little Eagle and Little Eagle SE quads for location of following exposures which make up locality 51

A.- Measured section, collections from several zones concs. ●

B-

[redacted]

Loc. 51 East bluffs of Little Oak Creek — Sec. 7, T. 19 N., R. 27 E. — numerous small exposures on toes of spurs etc. **(See above)**

Exposure A. — Toe spur in SW¼, SE¼, NE¼, sec. 7, measuring up from lowermost shale exposure.

5.0 — ? Dark gray, silty shale, blocky fracture, brown Fe stain on fracture surfaces. Grades to unit above. Unit weathers gray, [illegible] color — except where [illegible]

E.B. / T.C.

(2) 9.0 Shale, silty, gray mottled with light yellowish grey and jarosite, some brown Fe [illegible] areas which are [illegible] clayey silt — these begin 3' above base — appear lenticular. Jarosite concentrated chiefly in lower 3 ft and in band 4.5 to 7.0 from base.
At top 15 zone scatt. flattened ovoid concs, [illegible] — some punky — which weather gray [illegible] thick silty gray [illegible] — usual D. nic. type, are 1 to 1.2 thick up to 2.0 [illegible].
Unit weathers light gray with yellowish splotches

(3) 2.5 [illegible] [illegible] jarosite, [illegible]

A399

Lot #1 - 2 small D. nic. concs in place

upper foot. Some ls concs with large Gervillias too in this interval

(4) 10.5 Silt and ~~v~~very fine sand irregularly interbedded and mixed with clay. Interbeds few - in basal 2.0 clay minor constit. Silt + sand weather ~~to~~ light grayish brown ~~grey on steep slopes; in~~ buff or light orange-brown ~~on gentler slopes~~. Top arbitrarily taken at scattered OB weath concs of dk grey ls. with large Gervillias exclusively in some, large G's

A404 + Pecten [illegible] in others (incl small Gryphaeas + Spiriferinas) **Lot 2**

Some have thick [illegible] purple [illegible]

(5) 7.0+ Interval from top Big G. point to top Gervillia concs. Considerably more clay [illegible] than above [illegible], [illegible] grey [illegible]

A405 Lot #5 Gervillia + Gryphaea concs [illegible] go to about [illegible] top, [illegible] to fine [illegible] sand [illegible] generally [illegible]. At top it is [illegible] about [illegible] beds [illegible]

base overlying unit.

(c) 16.5 silt and sand clayey, mottled, grey [illegible] to grey, some faint [illegible] [illegible] locally — and minor silty and sandy clay. Sandier parts usually [illegible] brown stain. Chiefly massive. Lower 0.6 [illegible]. In upper 4.0 grades to greenish sand, slightly glauconitic, which weathers orange brown. Capped by OB with ls concrs. scattered thru sandy jacket zone in upper 2.5.

At 5.5 from base scatt round ls concs with brown calcite in cracks have many ammonites — chiefly nicolleti — this is D. nic zone #2 of collecting

A 410 tags. **Lot #3**

Concretions at top - Hard sandy ls. cores in thick sandy jackets. Some barren, some PB of Protocardia with some large Gervillia & P. [illegible].

A 411 Others a PB of P. [illegible] [illegible].

Lot #4

Locality 53. Exposures along southwest-facing bluffs of spur trending SE from center of S. line, sec. 13 into NE 1/4 sec. 24, T. 20 N., R. 26 E., Little Eagle quad., Corson Co.

Lower bluffs chiefly from top Elk Butte memb. into Gervillia layers of Trail City.

Hill A. — Large "barren" conc. layer with yellow calcite cement and a few small Solen-like clams crops out in SW bluff of this hill. Could not certainly locate Protocardia conc layer below it - may not be exposed. Fossiliferous concretions collected are from float coming from above "barren" conc zone - at least one of them is. This has many P. linguiformis, abundant ammonoids incl. many juveniles - looks like Moreau stuff. However it was not possible to tie this higher stuff in with the lower slump blocks of the Trail City.

Some odd-ball nicolleti concs at this locality also, but none found in place.

Nicolleti and Gervillia conc. layers, also the large Gervillia-Limopsis layer distinct and collected from both in float and in place.

Locality 52 – Northwest-facing bluffs of spur in SE¼, SW¼ sec. 5, T. 19 N., R. 27 E., Little Eagle quad., Corson Co., and their extension into a narrow gulley just over the south line into section 8.

Collections from two principal parts of these bluffs, those labelled 52 are chiefly from the exposure on the NE side of the narrow gulley in section 8, those labelled 52A are from an amphitheatre-shaped exposure at opposite end of locality in NE¼, SE¼ SW¼ sec. 5. At this latter place several of the Upper nicolleti concs found in place and in float. The section exposed is similar to that measured at locality 51 A, but not quite as much is exposed.

The upper D. nicolleti layer seems unusually well represented by concretions in the area of localities 51 and 52.

Locality 54 - Southwest-facing bluffs of spur trending SE through S½ sec 18 and joining terrace NE Little Eagle in NE¼ sec. 19, T. 20 N., R. 27 E. Chief exposures are in E½, SE¼, SW¼ and S½, SW¼, SE¼, sec. 18, and NW cor. NE¼ NE¼ sec. 19.

Problem of nicolleti concretions here. Some concretions of uncertain position in slope contain fauna featuring abundance of D. nicolleti, but also elements such as "conradi" tribe which elsewhere appear first in PB conc. layer or large G.-P.B.

Possibly these odd D. nic concs are higher than the lower D. nic layer but occur lower than PB horizon.

Need some short sections here to try to resolve this. The odd-ball concs are different core-type than usual D. nic concs.- a harder, bluer limestone lacking the thick silt jackets.

Partial sections at fence exposure:-

A. About 20' west of fence, beginning at base of Trail City on gentle streak with 1s concs - elongate - having thick, laminated to thin-bedded

silt jackets.

10.0 – to fossiliferous conc. JM-1, a hard gray ls conc, with purplish stained (manganiferous?) pitting surfaces, hard, weath OB to red brown, has very thin (1/2"±) rind of gypsum, no jackets.

About 6' from base is a barren, conc with tough silt jacket small barren ls conc

Elk butte –
T: 21 City

(1) 7.0 – Clay, mottled bleached gray and dark gray with jarosite blotches and concentration of same in lower 1 foot. At top is scattered conc layer* thick oval gray calc jackets around small lite gray ls [illegible]. At base scattered conc, but most [illegible] bedded silt jackets.

(2) 3.0 To first of hard ls. ledge (JM-1)

c. Farther west along bluff the sequence is down-dropped.

Concretion layer, scattered ls concs with thick, tough, grey jackets - barren. (Layer of preceding section)

(1) 14.0 Mixed silty grey clay and fg to vfg yellowish weath ss., in irregular pods + stringers. Weath buff, sndy slt with scattered hard ls concs, some fossiliferous, between 3 and 7' from base. Some with B. [illegible] and varied fauna. (JN-1) (**KMW-1**) ~~[illegible]~~ former 3.0 from base, ~~[illegible]~~ latter 3.5 to 6.0 from base.

At top - [illegible] grass roots. Some [illegible] concs appear in self jackets. Big G - + B in float and one in about 12-13 ft from base.

Lower 3 to 6 ft shale [illegible], more sandy above this.

Some of hard ls concs are barren - others full. [illegible] large, Inoceramus, Sphaeriola,

(2) 6.0± Grassy slope - to highest - G. [illegible].

Loc. 55 Small NE-facing bluff in SE¼, NE¼ and NE¼, SE¼ of SE¼ sec. 11, T. 19 N., R. 26 E., on Little Eagle SW and Little Eagle SE quads, Corson Co.

Limited exposure with Elk Butte–Trail City contact, some fossiliferous D. nic. zone concs, and a cap of Gervillia concs.

Loc. 56 St Patrick Butte area. A large area of exposures in a SW-facing scarp and gulley heads and divides occupying much of sections 26 and 28, T. 15 N., R. 21 E.

On scarp and upper divides are local badlands in the upper banded beds of the Fox Hills. In gulley heads and courses are shaly sands with concretion layers which carry the upper Fox Hills fauna.

Numerous sub-localities probable here so no further details at this point. Note that between Greenglass Butte and this locality the banded beds must make their appearance. Check them here for glauconite zone or zones – about only tie-in possible with the Greenglass section.

Loc. 57
now
57C

End of divide east of Redwater Creek—in SW¼ NE¼ NW¼, sec. 32, T. 15 N., R. 25 E, Parede NE. Quad, on SW slopes and top of spur. Also top small knob just SE in center S½ N½ of sec. 32.

Beds from Elk Butte member to the Protoceratic - P. nebraskensis conc. layer(s) partially exposed. (A489)

Loc. 57A

Southwest facing bluffs of same divide in the SW cor. of sec. 29, T. 15 N., R. 25 E. Here partial exposures are better and permit composite from two sections. Collections — A487, A490, A491

Section 1.

(1) 11.0 to ? Typical Elk Butte dk-gray fleshy sh.

(2) 4.8 Mixed dk-gray shale + silt, mottled gray + light gray, Devosite bench at top

(3) 11.0 Mixed dk silty clay + clayey silt, Devosite blebs in upper 6'. Isolated gray lenses - very thick silt pockets. From about 3 or 4' to 8' from base. All barren here.

(4) 5.5 Grass covered slope to layer of chiefly barren P2 cones - see Section 2

57A – (cont.)

Skeleton section 2: Begins on Limopsis cones, which are gray is weathering Orange brown and purple brown, break to angular chunks. Sparsely fossiliferous and a few scattered P-B cones – rare.

(1) 21.0

Silt, clayey, gray, mixed, with blebs + stringers of sand, some OB stain. Lower 12 ft, more clayey, weaths to gray checked slope, upper half more sandy, light brown gray – much of which prob. wash from above

(2) 25.0

Sand and silty gray clay crudely stratified to mixed; sand weaths yel. gray to OB, slope weathers to lite yellow brown or gray. Banding in basal 3'. About 10± from base is zone scattered yellow brn cones with silty gray jackets. Barren here.

From 5 to 11 feet above base is zone of Protocardia – P. nebrascae cones. Some barren some very fossilif.

Upper 4.0 obscured.

(3) 6.0 — Sand, glauconitic, fg, clayey; weathers O-B in lower 3', more clayey, gray-weath. above. Capped by zone large barren concs., gray weath., yellow calcite in cracks.

Locality 57B (Tow loc II 13)

Chiefly the SW slopes of NW trending spur of divide in center of line between sections 29 and 30, T. 15 N., R 25 E.

Collections chiefly from Protocardia layer but some concs largely made up of D. nicolleti may be from upper D. nic. layer. These found in grass roots about 17 ft above the concs of the Peanut brittle. A488, A492

Localities **57, 57A+B**

Exposures at these localities show well the changes taking place in lower Trail City between the Whitehorse localities and Route 63 localities.

(1) Concretions of the D. nicolleti zone are abundant - that is the lower ones with thick grey, laminated to massive silt jackets and black gypsiferous rinds, but the gray limestone cores are small and out of 30 or more examined

only one had a few D. nicolletis. Also, sparingly present in these layers are small (up to 0.8') flat-ovoid limestone concs with whitish patina and some "vermicular" markings on outside. One small ovoid conc with part of one nicolleti and a concretionary living chamber of one of the big nodosus-type scaphites, was found. No hard, blue is D. nic concs without sockets.

(2) The Peanut-Brittle concretion layer is present but very sparingly fossiliferous. The concs are distinctively orange-brown-weathering, ovoid, and break up to angular chunks stained OB and purple-brown. Some have one or two Limopsis scattered about, and about one in 20 is a typical Limopsis-packed conc. The layer is very helpful in locating in section.

(3) No Gervillia concs seen in any of the exposures though a few G's occur locally with the PB.

(4) Nothing seen in place between PB's and Protocardia concs

except some barren red-to Orange-brown weath. blue-gray limestone concs that are locally scattered about at change to sandy beds (see 57A - section 2).

However float at 57 and 57B suggests that the upper D. nic layer may be fossiliferous and present.

⑤ The Protocardia-nebraskensis concs appear to come from an interval of about 5 or 6 feet beginning about 4 feet above the change to dominantly sandy beds. The concs commonly have silt jackets, are hard dark blue-gray ls cores when fresh and are abundantly ammonitiferous.

⑥ Glauconite zone occurs well above the Protocardia concs here - Compare this with Loc. 50 (Happy Hill)

⑦ Barren zone of large concs overlying the glauconite zone has large - chiefly gray-weathering concs some with yellow calcite cement in cracks. One spec. of fossil found - Lucina occidentalis.

[56-A = 2.10]

Loc. 56-A, section 1

Begins at least 40 ft up from first river terrace in gulley E end of large slump. Horizon of start unknown and first interval may be partly slumped

(1) 15.1 Silty gray clay and clayey silt, chiefly mixed, has about 1 ft of good silty gray-dk gray clay at base. Scattered small gray ls concs. 2 or 3" diam and some flat-ovoid yellowish gray weath. ls. concs., some with silty rinds. Scattered jarosite blebs.

Sample 1 in basal 1.5

Sample 2 in upper 2.0

At top is layer scattered huge (3. to 4. in long diam.) ls. concs. which weather light yellow to rus brown.

Sandy clay at least near top.

(2) 14.0 Sand, vfg and silt, tough, clayey hard, no bedding structure. Very few jarosite blebs. At about 4.0 from top scattered concs.

Comparable [illegible] in next [illegible]reciable gulley to E begins on conc layer base of unit (3), traced over.

OLD UNIT	NEW UNIT	FEET	
(3)	(A)	6.6	To top persistent conc unit [illegible] brn weath, locally [illegible], some scat concs between. concs vary in size up to 3'± in [illegible] diam. Matrix is clayey sand.
4.	[illegible]	20.5	[illegible] sand, [illegible] [illegible], [illegible] highly glauconitic [illegible] + [illegible], [illegible] 5.5 [illegible] that [illegible] rusty [illegible] [illegible] 15.0 [illegible]. Loose [illegible] scat in lower [illegible] is [illegible] [illegible] concs, [illegible] clay [illegible] upper 3 to 4 ft; which is [illegible] [illegible] [illegible]
	[illegible]	5.8	[illegible] sand, at top [illegible] layer [illegible] [illegible] [illegible]
[illegible]	[illegible]	[illegible]	[illegible] upward. [illegible] [illegible]
[illegible]	[illegible]	[illegible]	Lower 5 [illegible] be [illegible] upward [illegible] silt, clay [illegible] with [illegible] [illegible] [illegible] [illegible] 6.0 [illegible] upper [illegible] persistent [illegible] [illegible]

which are [redacted] commonly full of Protocardia & various [redacted] other stuff.

Note [illegible] extensive [illegible] units.

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and fossils loose in silt. Concs punky, OB weath. Fossils include Ostrea sp, Nucula, Pteria linguiformis, D. nebraskensis. Hard (barren) Fe brn conc layer 0.6 to 1.0 at top, [illegible]

Not barren – some loc. fos, Ostrea (sm), Pteria assoc.

(3) 6.5 — As above (unit 2) some fossilif. orbrownweath. concs at top. Big Cucullaea, P. linguiformis, Tellina scitula, Ostrea.

also scat concs and loose [illegible] [illegible] fors.

(4) 30.2 — As above but becoming somewhat softer – slightly more clayey in upper 13 ft. In lower 6 feet, big Cucculleas loose in ~~silty~~ matrix. And 0.4 from top – Big Sphenodiscus loose in matrix

Sand sample 1962 from here

(5) 0.8± — Thin ledge lite grey crumbly limey silt with gyp and conc in cone

(6) 5.2 — As in (4) above. Some scattered OB weath concs at top, these barren where seen, about 0.6 to 1.0± in diam.

(7) 21.0 — As in (4) above. Scattered fossil. concs. begin about 7 or 8 feet above base. At top is persistent layer yellow to OB concs, most flattened – some fossiliferous ovoid.

⑧ 22.0± Clayey dark gray silt and silty clay with scattered jarosite blebs. Locally some punky OB wezth fossilif. conc masses 11 feet from base, sharp color change at top. Unit becomes siltier at top. [Coll C]

[C310

→ Big cuc's, P. linguif. suzila - punky squashed

⑨ 16.0 Clayey silt + silty clay, brownish gray, weathers light brn. gray. Fe-stain locally. May be lighter because it is at top bluff but cannot tell for sure.

At top is 1 to 3' zone, scattered OB wezth. ls concs with gray silt jackets. Has sparse fauna - Nucula, Tellina

Top of bluff

Notes on unit ⑦ - most fossiliferous in section

A468 }
A470 ⑦ } 7 to 9' { [Coll A]

[Coll B]

Scattered concs made up chiefly of P. linguiformis, Cucullaea - mostly small + some Gervillias, A mash - ammonoids crushed.

1. [illegible] 15
[illegible] d
on S. B [illegible] with [illegible]
from S house +B, Ntbk 1962-1, p. 7.
Also consult [illegible] were 56C - [illegible]
2nd section at 212 in 1962 ntbk

Loc. 56B. Section 1

Begins at the first layer of concretions below the 'bentonitic zone'. This layer may be same as that capping 56A section 1.

Concretions in grass roots

① 5.0 Covered, grass and wash from bentonitic zone

② 19.5± Bentonitic zone, chiefly wash and popcorn to zone. Small platy silt concs at foot of slope.

③ 17.0 Banded beds - Interbedded light grey siltstone and grey bentonitic shale. Occ. clam, crushed clams and finely disseminated plant frags in lower 3 feet or 4 feet. Bedding chiefly 1" or less, but several fairly thick siltst. layers are conspicuous. Numerous small Fe stained concs, flat red brn. - confined to silt

		bnds. Some shale beds up to 3'.
(4)	1.0	Siltstone and fine-grained ss, latter chiefly in platy friable $CaCO_3$ cemented conc. masses. Weaths white with some red stain.
(5)	10.0	Banded beds as in (3) below.
(6)	7.0	Chiefly silt and vfg sand with about 6" basal silt, then 1 or 2 ft silty clay before chief ss body comes in. Vfg silty lite gray sand weaths white with Fe stain loc. A variable X bedd'd sand some clay locally thickens & thins.
(7)	2.7	Vfg sand & silt, chiefly massive Fe stained blotches, light gray, and irreg. small earthy limonitic concs.
(8)	3.0	Lower foot is friable silt with laminae & thin beds of lignite in middle 4", clay in top 4. Above this is bench on silt tuffy & locally zone buff calc concs - weath gray with

		brn + blue stain, these are 1.5 to 2 from base, remainder of interval chiefly gray "paper shale"
(9)	12.8	Banded beds again, this series with gray silty shale + shaly silt commonly with abund. plant frags loc. liq. partings, and yellow to orange weath fg sand. Basal 4.5 chiefly a gray s.l-m shale some 0.3 fe sst. (.) bands. Above this are obviously banded - but more lent. bedding than in lower banded beds.
	4.5	Sandstone, fine to v fg, massive to crudely x bedded (?). weathers buff.
(11)	2.0	Banded zone, sand with partings and thin interbeds gray shale, fine plant frags common.
(12)	2.0	Sandstone as in 10 above but with orange stained small fe concs scattered in it.
(13)	2.2	Banded as in (11) Some orange fe platy concs in sandy layers

(14)	2.8	Sandstone, as in 12 below with local Fe stain coverage
(13)	4.6	Bentic zone as in 13 + 11, chiefly silty to sandy shale.
(12)	6.0-?	Sandstone, as in 14 below, but with huge ovoid calc. concs. 6' ± in long diam. Lime cemented ss, weath brn to brn gray, exfoliate, have rinds. The concs in lower 3 to 4'

Grass roots top of bluff.

Laterally unit (16) has some clay pellet zones with poorly preserved fossils in it. See Coll. 56 B #1

See Podewan Section #3 for more detailed measurement

Loc. 56-C Section 1.

Measuring up from the Tellina-Nuculz conc. layer at top of 56 A section Coll. 56-C #1

(1) 7.0 Shaly, sandy, silt, grey, with pockets of oysters, snails, Protocerudia & small belemnites. Some frags ammonite shell. ~~(56-C, Sect. 1, Sample 1. from 5' above base)~~ Thes mostly, from 3 to 6 ft above, base. At top tan ferruginous - orange-yellow, layer, locally 2 second 0.8 to 1.0 from top. Coll. 56-C #2.

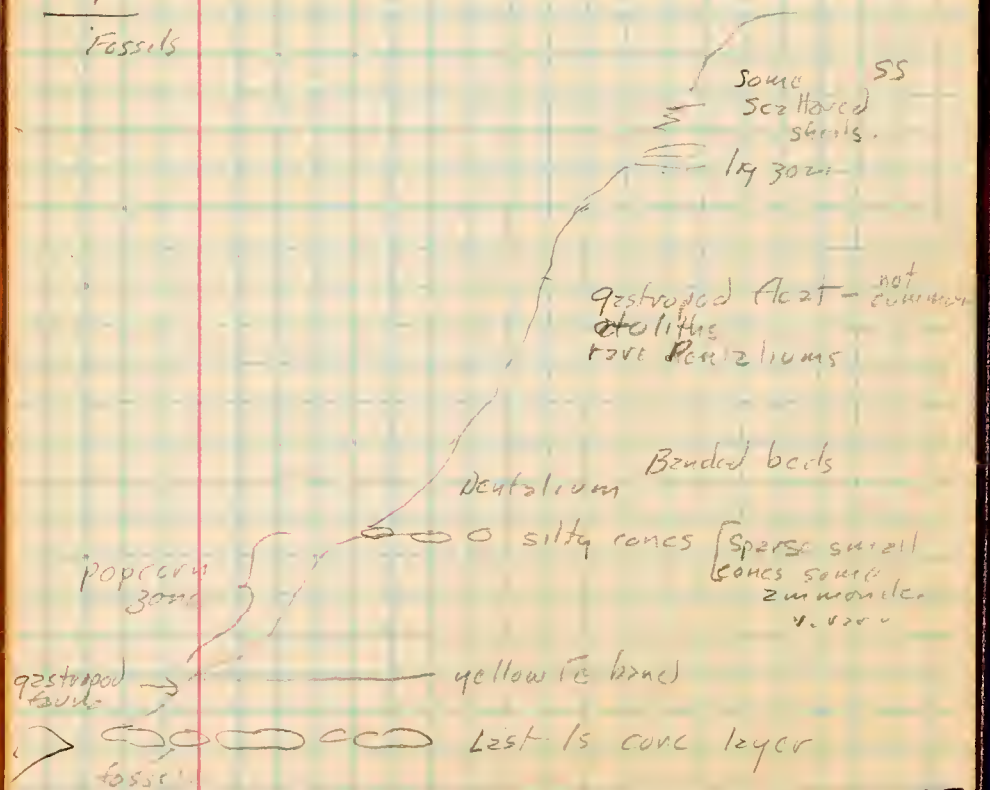
(2) 19.0 Shale, grey fine, silty, sandy texture becoming mottled light & dark grey and interbedded with silt in upper 8' +or-. (~~56-C Sect. 1, Sample 2 from~~ Coll. 56-C #3 8 to 11 feet above base.) Weathers to grey popcorn zone which is continuous along base of St. Pet. bluffs.

At top is layer scattered pebbly silt. st. conc.

③ 39.0± Banded beds, gray to brownish gray, about 1' papery gray shale at top.

④ 15.0–? Sandy beds. Alternation of massive ss beds containing Orange fe conc layers – thin, end blebs, weath. to chips – with interbedded ss & gray sh. Some calc cemented, friable ss masses

Fossils



Loc 30-E

Conc layer at top, = Lucina concs. unless I'm off on slump. Two scaphoids found in small ovoid concs 8' ± beneath it. 35' ± beneath a D. nicklini from local conc layer. Also the pre-nebrascensis type in float between 5 + 15 feet below top conc layer.

Shipping data

Box 1	Loc. 46 - D. nic in place + float other float Loc 47 - PB, Gerv. & D. nic float.
Box 2	All Bullhead - sections & float
Box 3	Loc 46 - D. nic in place Loc 20 - Gervillia concs Loc 2 - PB float Loc 3 - " " Loc 1 - D. nic in place Loc 48 - Halymenites sand Loc 49 - Teredo bed Loc 49 - "Colgate" on bottle top.
Box 4	Loc 38 - Pt 65 Gravel pit Loc 31 - 2 small lots from conc. float. Loc 32 - conc. float & fish Loc 30 - float, small D. nics in float, P. linguiformis conc in float, Lucina conc layer in place. ~~Loc 30D~~ Verdigre collections LOC 35 - Cucullaea from rd cut.
√Box 5	Foram samples - Loc. 31, Sect 1, S 1 thru S 17
Box 6	Foram samples - Loc. 31, sect 1, S 18 thru S 36
√Box 7	Foram samples - Loc. 31, Sect 2, S 1 thru S 9 Loc. 45, S 1 thru S 5

Box 8. Loc 30C - Big sphenoconcs in place.
Loc 35 - Laundry dam - 2 lots
Loc 51 - Section at A, Lot #3

Box 9. Loc 50 - Forsm samples - sec [redacted] only

Box 10 Loc 100 + 102 Foram samples

Box 11 Loc 100 + Loc 50 SEC 2
Foram samples

Box 12 Loc. 45, inv. and part of Loc. 54 coll.

Box 13 Miscellaneous forsm samples

Box 14 Mostly 54, 2 small pkgs from 50

August 6, Shipped all of above except
Box 13 from Mobridge by freight

Summer 1959

Collect for special study:—

1. Samples of concretions - Stratigraphic
2. Forem spot samples - Fox Hills + Up. Pierre
3. Forams - Briem member + any Hell Cr. shales that look suspicious.
4. Mobridge microfauna tied to measured sections. Get microfauna too.
   a.) Might "piece" bluff exposures up the Moreau to tie in the section at Locality 32 with the Fox Hills.

Circle, Muchlev — Bullhead